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are fully as slow as any of the negative ones.

At higher temperatures the air is ionized to more than molecular distances from the wire.

When the air was enclosed within a tube the rate of discharge became very small. Apparently particles are driven off from the wire at the higher temperatures which are suspended in the air within the tube. These collect on the ions and greatly retard their velocity. These particles do not aid in the discharge, but materially diminish it. Their presence may also be shown by their acting as nuclei in the condensation of water vapor.

These particles are found to be attracted more by the negative ions drawn from a flame than by the positive. It is, therefore, probable that they cause the negative ions in the discharge from the wires to have a smaller velocity than the positive.

Their presence is also shown when the wire is heated in hydrogen, although to a smaller extent. It therefore seems probable that they are particles of platinum, and not of an oxide of platinum.

When the wire is first heated in a vacuum, the discharge is much larger than at any time afterwards. Heating the wire in hydrogen largely restores to it the power of producing discharge. At least some of the discharge would therefore appear to be caused by occluded hydrogen.

The rate of discharge in a vacuum is much larger than in air, but it was found to be impracticable to find the velocity of the ions in a vacuum.

A complete account of the work will be given soon in the *Physical Review*.

C. D. CHILD.

PALEONTOLOGICAL NOTES.

NORTH AMERICAN ELEPHANTIDS.

ANY one who has had occasion to study either the elephants or mastodons of North America needs not to be told that the species of each are very indefinitely known and, for the most part, very imperfectly characterized. Most of the species are based on teeth, one or two on a single tooth, or at the best the

description includes fragments of the jaw. Specimens which have been gradually accumulating in the U. S. National Museum make it possible to at least commence the revision of the species of our elephants, while the material that has been gathered by the field parties of the American Museum of Natural History will throw much more light on the subject.

Of true elephants there appear to be three good species, *Elephas primigenius*, *E. columbi* and *E. imperator*. The first-named, the northern mammoth, a species of moderate size, having teeth with narrow enamel bands, seems to have ranged from Alaska southeasterly to about the latitude of Washington, D. C.

A line drawn from Washington to St. Louis and thence northwestward to Victoria, B. C., would roughly mark the southern boundary of its habitat. To the south of this line, extending to Florida and to the city of Mexico, is found *Elephas columbi*, a much larger animal on the average than the northern species, having teeth with coarser enamel bands. There seems to be an overlapping of the two species, especially in the northwestern United States, as noted by Professor Cope, and along this line it is difficult at times, if not impossible, to tell from which of the two species individual teeth have come. Fully grown examples of this species must have attained a height of thirteen feet.

Elephas imperator was based by Leidy on an imperfect upper molar from the valley of the Niobrara distinguished by its great size and extreme coarseness of structure. This specimen long remained unique and was finally considered by Leidy to be the same as *E. americanus* or, more correctly, *E. columbi*, since the former name is unusable, being a synonym. Last fall, however, Mr. W. H. Holmes obtained in Indian Territory a considerable number of teeth of both *Elephas* and *Mastodon* from the same spot, comprising molars of *M. americanus*, *E. columbi* and some referable to Leidy's *E. imperator*. Teeth of this species may be distinguished from similar teeth of *E. columbi* by their coarse structure, the large amount of cement and the small number of enamel plates. Thus

an upper molar of *E. imperator* has 17 cross ridges and one of *E. columbi* 21 or 22, while the number of ridges in the lower molars are respectively 18 and 22, this last being an estimate owing to the lack of a perfect specimen for comparison. In each case the molars of *E. columbi* are smaller. Thus Leidy's species may be considered as definitely established.

The mastodons are, as species go, in a badly mixed condition, and even the status of the abundant and widely distributed *Mastodon americanus* is by no means so well defined as one could wish. The last molar of this species varies enormously not only in size, but in proportions and character of the enamel, and while the typical last molar has four cross crests and a heel, there may be four cross crests only, or five cross crests and a heel. Moreover, while the enamel is usually quite smooth, it is often more or less rugose, in some instances being decidedly wrinkled, and *M. rugosidens* of Leidy is undoubtedly based upon a tooth of this character. A fine series of teeth obtained by Mr. W. H. Holmes at Afton, Ind. Terr., shows the great range of variation in the teeth of *M. americanus*.

M. shepardi, once called *obscurus*, from California, is a good species, characterized by a small narrow last molar and by the partial interruption of the valleys on one side. The true *Mastodon obscurus* is a species founded by Leidy on an imperfect last molar from North Carolina, described and figured on plate XXVII., figure 16, of the Extinct Mammalian Fauna of Dakota and Nebraska. This species is so far definitely known from our eastern coast from Florida to Maryland, and the specimens described as *M. floridanus* must be known as *M. obscurus*. The writer pleads guilty to having overlooked this when editing Dr. Leidy's posthumous paper on fossil vertebrates from the Alachua Clays. It is probable that *M. serridens* of Cope is a slightly aberrant fifth molar of *M. obscurus*, although it was decided otherwise in the memoir just referred to. Dr. Leidy was perhaps over-cautious in making new species, and described no less than three mastodons under the name of *obscurus*. As an offset to this it may be

said that there is reason to believe that Professor Cope went to the opposite extreme of describing one species under three names.

Mastodon mirificus, with a last molar having six much-wrinkled cross crests, is another well-defined species, but there are several others that are not at present well defined. Among these is *M. proavus* of Cope, which he doubtfully separated from *M. angustidens*, and may prove to be the same as *M. obscurus* (= *floridanus*) of Leidy. The writer has never seen a tooth of mastodon from an American locality that was not readily distinguishable from the European *M. angustidens*, and he ventures to doubt the occurrence of this species in North America.

M. productus Cope is another dubious species and so is *M. tropicus*, whose teeth as figured by Cope are indistinguishable from those of *M. obscurus*, while the figure of *M. proavus* strongly suggests the true *M. shepardi*. That one tooth has one more cross crest than the other and is more pointed at the heel means little, as just such differences are known to exist in the last molars of *M. americanus*, while the last molars of various mastodons appear to be exceedingly variable.

The identification of the species of mastodons from scattered teeth is, if not impossible, at least extremely difficult, while the attempt to identify species from figures is equally unsatisfactory. Another question on which light is needed is whether the presence of lower tusks and a long symphysis to the lower jaw is a specific or sexual character, or whether it may not be specific in some cases and merely indicative of sex in others? There are certainly specimens of mastodon jaws with and without tusks whose molars are indistinguishable. It is to be hoped that the time is not far distant when we may have sufficient good material to place our species of mastodons on a satisfactory basis.

F. A. L.

CURRENT NOTES ON METEOROLOGY.

THE DUST STORM OF MARCH 9-12, 1901.

THE remarkable fall of dust which occurred over Europe about a year ago has been noted in numerous short articles in various scien-